

Workplan for Fiscal Year 2007
August 25, 2006

I. Program Title Anadromous Fish Restoration Program (AFRP) - Central Valley Project Improvement Act (CVPIA) 3406(b)(1)

II. Responsible Entities

	Agency	Staff Name	Role
Lead	USFWS	Kim Webb	Acting Program Manager, Anadromous Fish Restoration Program
Co-Lead	USBR	Ken Lentz	Program Liaison, United States Bureau of Reclamation(USBR)/Anadromous Fish Restoration Program

III. Program Objectives

The goal of the AFRP, as stated in Section 3406(b)(1) of the CVPIA, is to "develop within three years of enactment and implement a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991". Section 3406(b)(1) also states that "this goal shall not apply to the San Joaquin River between Friant Dam and the Mendota Pool".

The objectives for the Anadromous Fish Restoration Program (AFRP) can be found in the Final Restoration Plan for the Anadromous Fish Restoration Program (Restoration Plan)¹.

1. Improve habitat for all life stages of anadromous fish through provision of flows of suitable quality, quantity, and timing, and improved physical habitat.
2. Improve survival rates by reducing or eliminating entrainment of juveniles at diversions.
3. Improve the opportunity for adult fish to reach their spawning habitats in a timely manner.
4. Collect fish population, health, and habitat data to facilitate evaluation of restoration actions.
5. Integrate habitat restoration efforts with harvest and hatchery management.
6. Involve partners in the implementation and evaluation of restoration actions.

The Restoration Plan was completed in 2001 to guide the long-term development of the

¹Final Restoration Plan for the Anadromous Fish Restoration Program, A Plan to Increase Natural Production of Anadromous Fish in the Central Valley of California. Released as a Revised Draft on May 30, 1997 and adopted as final on January 9, 2001. CVPIA, AFRP, Stockton, CA. [http://www.delta.dfg.ca.gov/afrp/restplan_final.asp].

AFRP. The Restoration Plan provides a programmatic-level description of the AFRP and, is used to guide the implementation of all of the provisions of the CVPIA that contribute to the goal of making all reasonable efforts to at least double natural production of anadromous fish (AFRP doubling-goal). The following provisions contribute to accomplishing the goal of the AFRP (b)(1) program: b2, b3...etc. The Restoration Plan presents a list of reasonable actions and evaluations and a process by which actions and evaluations were determined to be reasonable. The Restoration Plan identifies the need for partners, local involvement, public support, adaptive management, and flexibility as key attributes of the AFRP approach.

To implement this plan, in 1995 the USFWS established federal Habitat Restoration Coordinator (HRC) positions assigned to specific geographic areas from the upper Sacramento River and its major tributaries south to the San Joaquin River and its major tributaries. In 1998, the AFRP added three more HRCs from the California Department of Fish and Game (DFG) to this effort. These state HRCs provide assistance to the USFWS and ensure close coordination with the DFG the state agency with trust authority for managing anadromous fish populations in California. In their assigned areas, HRCs represent the AFRP, develop and nurture partnerships, develop projects with partners that contribute to the AFRP doubling-goal, and oversee all aspects of implementation of projects in which the AFRP invests funds. Together, the USFWS and DFG HRCs form an interagency team to coordinate, develop and implement restoration projects consistent with the goal, objectives, strategies, processes and priorities described in the Restoration Plan.

The AFRP is one of five Central Valley Project Improvement Act (CVPIA) programs that has been integrated with the California Bay-Delta Authority (CBDA) Ecosystem Restoration Program (ERP) (Record of Decision, 2000)². To facilitate this integration, the above objectives are included in the CBDA ERP Draft Stage 1 Implementation Plan.³ These objectives are also complementary to other goals and objectives listed in the Draft Stage 1 Implementation Plan and would help address the objectives of the CBDA's Multi-Species Conservation Strategy⁴ and the Biological Opinion for the CVPIA⁵. The AFRP shares CBDA's vision of the Single Blueprint concept which provides a unified and cooperative approach to restoration. The AFRP is committed to integrating its activities with the Ecosystem Restoration Program's actions and evaluations and using a

² Programmatic Record of Decision, CALFED Bay-Delta Program, August 28, 2000. Sacramento, CA

³ Draft Stage 1 Implementation Plan, August 2001. Ecosystem Restoration Program, CALFED Bay-Delta Program. Sacramento, CA

⁴ CALFED Bay-Delta Program Multi-Species Conservation Strategy. August 28, 2000. California Bay-Delta Program. Sacramento, CA

⁵ Programmatic Biological Opinion for the CVPIA. January 27, 2000. USBR. Sacramento, CA

scientifically-based adaptive management approach to achieve AFRP objectives.

IV. Status of the Program

The Restoration Plan presents the goal, objectives, and strategies of the AFRP, as well as a list of reasonable actions and evaluations. The Restoration Plan identifies the need for partners, local involvement, public support, adaptive management, and flexibility as key attributes of the AFRP approach to making all reasonable efforts to at least double natural production of anadromous fish.

AFRP projects implemented from actions and evaluations in the Restoration Plan since 1995 have addressed environmental limiting factor categories that were derived from Central Valley watershed limiting factors listed in the AFRP Working Paper (Working Paper)⁶.

Table 1 is a compilation of information related to the progress made towards addressing these environmental limiting factor categories identified in the Working Paper and implementation of the restoration actions and evaluations in the Restoration Plan (that are based on the Working Paper's limiting factor categories). About 40% of the environmental limiting factors in the Working Paper have been addressed and 30% of all Restoration Plan actions (289) and evaluations have been implemented in the 1995 to 2006 time period.

Since 1995, of the 89 high and medium priority structural actions and evaluations in the AFRP Plan, 32 percent (8 of 25 total) of the habitat (riparian, channel and floodplain) restoration actions have been completed and 44 percent (28 of 64 total) of the fish passage actions have been completed. Of the total 269 high and medium priority actions and evaluations in the AFRP Plan, 30 percent (81) have been implemented (36 structural and 45 non-structural). Some restoration project categories (gravel and flow projects) must be addressed continuously if certain resources are consumptively removed or blocked (e.g., water and gravel).

⁶ USFWS, 1995. Working paper on restoration needs, habitat restoration actions to double natural production of anadromous fish in the Central Valley of California, Volume 3, AFRP. [<http://www.delta.dfg.ca.gov/afrp/workingpaper.asp>].

Table 1. Percentages and numbers of Central Valley watersheds where actions were taken to address limiting factor categories identified by the Working Paper and AFRP Objectives 1-6 (Page 1) since 1995.

AFRP Working Paper identified limiting factor categories	Percent (and number) of Central Valley watersheds where actions were taken to address limiting factor categories	AFRP objective addressed, (1-6, Page 1)
Adult and juvenile entrainment	26 (7)	2
Stream habitat restoration	22 (6)	1
Fish passage	22 (6)	3
Predation	15 (4)	4
Spawning habitat	15 (4)	1
Effects of hatchery fish on natural stocks	11 (3)	5
Erosion and sediment control	7 (2)	1

In the early program years, the AFRP emphasized planning and environmental inventories. These were followed by implementation of habitat restoration projects. Restoration projects were implemented throughout the Central Valley watersheds in accordance with AFRP restoration priority criteria.

In FY2006, the following Project Tasks were funded to support the AFRP Program Objectives 1 through 6 (depicted on Page 1):

1. Improve habitat for all life stages of anadromous fish through provision of flows of suitable quality, quantity, and timing, and improved physical habitat.

Task 1- Perform SHIRA-based river analysis and manipulative sediment transport experiments in support of a hydrogeomorphic framework for restoring geomorphic processes and aquatic habitat in the Lower Yuba River. Includes: 1) SHIRA based analyses (post-flood resurvey and analysis of Garcia Gravel Pit pool-riffle-pool unit and 2D modeling of degraded Englebright Dam study reach under flood conditions); 2) sediment transport experiments; Englebright Dam gravel injection experiment; 3) evaluation of hydrogeomorphic self-sustainability of riffle-pool sequences; and, 4) 6-chapter interim research synthesis report.

Task 2- Improve spawning habitat availability, stabilize eroding river banks, and improve fish passage at two critical locations on the river on the Cosumnes River.

Task 3- Purchase and place gravel, using matching funds, in the spawning

reaches of the lower Mokelumne River during August to September of 2006.

2. Improve survival rates by reducing or eliminating entrainment of juveniles at diversions.

Task 4- Develop a draft “Ecosystem Diagnosis and Treatment (EDT) Results for Butte Creek and final “Project Description and Alternatives for the Sutter Bypass Restoration”

Task 5- Construct and upgrade the bypass pipe and headgate structure for the Orwick Diversion on Battle Creek.

3. Improve the opportunity for adult fish to reach their spawning habitats in a timely manner.

Task 6- Develop the final engineering design plans, specifications and an associated cost estimate for construction of the proposed Iron Canyon Fish Ladder on Big Chico Creek.

Task 7- Test Vaki Riverwatcher fish counting systems with upgraded digital camera units on the fish ladders at Daguerre Point Dam on the Yuba River to contribute to improving the understanding and opportunity for adult fish to reach their spawning grounds in a timely manner and reduce the entrainment of juvenile fish at diversions.

Task 8- Conduct adaptive management analyses of habitat restoration, fish ladder passage improvements and anadromous fish responses to flows on the Calaveras River.

4. Collect fish population, health, and habitat data to facilitate evaluation of restoration actions.

Task 9- Evaluate results of habitat restoration and population impacts of instream flow by estimating the abundance of juvenile salmonid outmigrants annually in the lower Merced River using two RSTs operated at Hagaman County Park (Rivermile 12). This project will (1) determine and evaluate patterns of timing, size, and abundance of juvenile salmonids relative to flow and other environmental conditions; and, (2) compare production estimates from an upstream rotary screw trap to estimates at Hagaman Park (Rivermile 12) to obtain indices of survival rates through the lower river.

Task 10- On the Stanislaus River, determine and evaluate patterns of timing, size, and abundance of juvenile salmonids relative to flow and other environmental conditions; compare production estimates at Oakdale (RM 40.1) to estimates at Caswell (RM 8.6) to obtain indices of survival rates through the lower river; determine contribution rates of fry, parr, and smolt outmigrants to adult escapement using coded-wire tags; and, determine the effects of differing instream flow schedules and/or other anthropogenic and environmental variables on life-stage contribution rates to production.

Task 11- Determine the total Chinook salmon and steelhead escapement in the Stanislaus River through direct counts, evaluate the effects of environmental factors on migration timing of fall-run Chinook salmon and validate traditional carcass count surveys estimates and validate against weir counts.

Task 12- Develop a stock recruitment model on the Yuba River as an adaptive management tool to compare baseline survival rates to those following planned gravel restorations.

5. Integrate habitat restoration efforts with harvest and hatchery management.

Task 13- Combine the otolith microchemistry and otolith microstructure methods to distinguish hatchery and naturally spawned Chinook salmon to provide optimal data on Chinook salmon population structure.

6. Involve partners in the implementation and evaluation of restoration actions.

Task 14- Develop a consensus based plan to direct the long term implementation of prioritized restoration/research in the Stanislaus River below Goodwin Dam.

Following 11 years of restoration project implementation (1995 to 2006), an increase of approximately four percent in natural production for all Chinook salmon runs combined and a 26 percent increase in fall-run natural production have been measured or estimated in Central Valley streams (Table 2). Production for some runs has increased more rapidly than for others. For instance, the fall-run has shown the greatest population increase while the other three runs (winter-, spring, and late fall-) have not fared as well since their watershed averages fall below the 1967-1991 baselines. However, eight out of 26 streams have exceeded baseline production for spring-run (in Butte creek) and fall-run (in Clear and Battle creeks and Feather, Yuba, American, Mokelumne, and Merced rivers), four of which have exceeded AFRP doubling goals (in Butte, Clear and Battle creeks and the Mokelumne River).

Table 2. Chinook salmon AFRP production doubling goals, average baseline production (1967-91), average natural production (1992-05) and average percent production difference from baseline in Central Valley streams.

Chinook salmon production in Central Valley streams¹	AFRP annual doubling goals²	Average baselines (1967-91)³	Average natural production (1992-05)⁴	Average % natural production difference from baseline⁵
All Chinook runs, all Central Valley streams	990,000	497,261	518,493	4%
Fall-run, all Central Valley watersheds	750,000	374,202	472,421	26%
Winter-run, all Central Valley streams	110,000	54,471	8,827	-84%
Spring-run, all Central Valley streams	68,000	34,410	19,962	-51%
Late fall-run, all Central Valley streams	68,000	34,178	20,283	-41%
Spring-run, Sacramento River	59,000	29,400	1,155	-96%
Spring-run, Deer Creek	6,500	3,273	2,489	-24%
Spring-run, Mill Creek	4,400	2,201	1,379	-37%
Spring-run, Butte Creek	2,000	1,017	11,988	1,079%

¹ Only streams and rivers with complete salmon production data sets (1992-2005) are shown.

² Annual doubling goals were derived from “Mills, T.J. and F. Fisher. 1994. Central Valley Anadromous Sport Fish Annual Run-size, Harvest, and Population Estimates, 1967 through 1991, California Department of Fish and Game. 62pp” and published in “USFWS. 2001. Final Restoration Plan for the Anadromous Fish Restoration Program, A Plan to Increase Natural Production of Anadromous Fish in the Central Valley of California. Released as a Revised Draft on May 30, 1997 and adopted as final on January 9, 2001. CVPIA, AFRP, Stockton, CA. [http://www.delta.dfg.ca.gov/afrp/restplan_final.asp].”

³ Baseline escapement data were derived from Mills and Fisher (1994) and used to generate natural production estimates for the doubling goal baseline period, 1967 through 1991.

⁴ Grand Tab, California Department of Fish and Game. Data from this publication was used to generate natural production estimates for the doubling goal, 1952 through 1966, and the doubling period, 1992 through 2001.

⁵ The percent of increased natural production over baseline for each watershed was calculated by subtracting baseline natural production (1967-1991) from natural production (1992-2005) and dividing the result by baseline natural production (1967-1991).

Fall-run, Sacramento River	230,000	115,334	78,257	-32%
Fall-run, Clear Creek	7,100	3,574	12,706	255%
Fall-run, Battle Creek*	10,000	5,012	23,192	363%
Fall-run, Feather River*	170,000	86,003	129,511	51%
Fall-run, Yuba River	66,000	33,252	41,550	25%
Fall-run, American River*	160,000	80,843	145,754	80%
Fall-run, Mokelumne River*	9,300	4,679	10,261	119%
Fall-run, San Joaquin River	Not set	38,381	26,542	-31%
Fall-run, Stanislaus River	22,000	10,868	7,484	-31%
Fall-run, Tuolumne River	38,000	18,945	9,612	-49%
Fall-run, Merced River*	18,000	9,003	9,446	5%
Late fall-run, Sacramento River	44,000	33,926	21,112	-38%
Late fall-run, Battle Creek	550	273	679	149%

* Hatchery supported Chinook salmon production

The AFRP doubling goal is assessed by calculating the number of naturally spawning fish. Currently, the AFRP has to use unreliable estimates of hatchery-origin fish contributions to calculate natural production. In order to more accurately assess natural production doubling efforts, AFRP is demonstrating new escapement counting technologies, Alaskan weir (Stanislaus River), Vaki-infra-red counting systems (Stanislaus and Yuba rivers) and hydroacoustics (Mill Creek). The AFRP is also trying to better define the percentage of hatchery-origin fish by looking at sulfur isotope (S_{32} : S_{34}) ratios in otoliths taken from natural spawning Chinook salmon from the Mokelumne River and compare these to ratios in hatchery produced stocks. This information will enable more accurate estimates of natural production.

V. FY 2006 Accomplishments

In FY2006, one AFRP Restoration action and three evaluations were completed (Butte Creek, A23, E14; and, Cosumnes River E2), all non-structural actions and evaluations. AFRP projects contributed to the future completion of an additional 59 actions and evaluations, of which 26 are structural and 33 are non-structural. In FY2007, AFRP anticipates completing one action (Battle Creek, A4) and one evaluation (Battle Creek, E6), both are structural.

During FY06, the AFRP focused on mostly ongoing projects. Table 3 shows the projects and funding levels for FY 2006 that will be implemented in FY 2007.

Table 3. List of projects funded in FY06.

Vendor Name	FY 2006 Budget	Watershed & Name of Project	AFRP Restoration Plan Action/Evaluation
Northstate Resources, Inc. (permitting), NOAA Fisheries (design) and competitive bidder (construction)	\$270,000	Battle Creek. Orwick Fish Barrier Improvement Project	Battle Creek- A4
HDR	\$198,362	Iron Canyon Fish Ladder Final Engineering Design and Cost Estimate	Big Chico Creek- A2
Unlimited Inc.	\$250,000	Butte Creek. Sutter bypass eastside, Fisheries Restoration Plan	Butte Creek- E6
South Yuba River Citizens League	\$44,045	Yuba River. Chinook salmon & steelhead life history evaluation	Yuba River- supports A1:A9 & E1:E4
University of California, Davis	\$299,998	Yuba River Study Utilizing the Spawning Habitat Integrated Rehabilitation Approach: SHIRA-based analysis, Phase II	Yuba River- E4
South Yuba River Citizens League	\$78,435	Chinook salmon and steelhead life history evaluation- VAKI Monitoring and Analysis (3-year study FY05-07)	Yuba River- A7
Fishery Foundation of California	\$200,000	Cosumnes River Passage and Habitat Improvement Project	Cosumnes River- A5 & E2
East Bay Municipal Utility District	\$ 100,000	Mokelumne River spawning habitat improvement project	Mokelumne River- A2
Cramer Fish Sciences	\$215,510	Stanislaus River juvenile Chinook salmon rotary screw trap (RST) monitoring and outmigration study	Stanislaus River- A2 & E6
Cramer Fish Sciences	\$100,000	Stanislaus River Restoration plan development and outreach	Stanislaus River- supports A1:A3 & E1:E6

			Central Valley-wide- A1 & A2
Cramer Fish Sciences	\$ 265,000	Stanislaus River. Test and Demonstrate a Portable Alaskan Weir to Count and Characterize Runs of Anadromous Salmonids in the Stanislaus River	Stanislaus River-supports A1:A3 & E1:E6 Central Valley-wide- A1
Cramer Fish Sciences	\$ 150,000	Merced River screw trap	
Lawrence Livermore National Laboratory	\$99,500	Evaluate Chinook salmon otoliths to determine hatchery or natural origin	Central Valley-wide- E2
Total	\$2,270,850		

FY 2006 accomplishments in watersheds

Battle Creek

The efforts of the Greater Battle Creek Working Group demonstrate the value of a well-represented, diverse group of stakeholders who are working at the watershed level to improve communication and information sharing on key aspects of the watershed restoration effort. Multiple projects are complementing the effort associated with the Battle Creek Salmon and Steelhead Restoration Project. For example, the Battle Creek Watershed Conservancy's website www.battle-creek.net/ was initiated with funds from the AFRP program in FY1998 (AFRP Restoration Plan, Battle Creek, A4). Projects that increase natural production of salmon and steelhead include fixing the inoperative fish screen at Orwick Diversion, a major agricultural diversion. Environmental permitting is underway to upgrade the bypass pipe and headgate structure for the Orwick Diversion is currently in the State and Federal environmental permitting process. The pipe is scheduled for construction in fall 2006 and the headgate structure will be constructed as soon as DFG and the diverter set up a maintenance agreement (AFRP Restoration Plan, Central Valley-wide, A1).

Mill Creek

A pilot hydroacoustic study is being conducted by LGL Limited, Environmental Research Associates on Mill Creek (AFRP Restoration Plan, Mill Creek, A1).

This pilot study is examining the effectiveness of using two hydroacoustic methods (split-beam and DIDSON) to count adult salmonid escapement. Data was collected by both the DIDSON and split-beam hydroacoustic technologies between the 5th of May and the 23rd of June, 2006. Data collected included: run timing and diel distribution of spring Chinook salmon and steelhead passage, target strength data, and fish lengths. Additional data was collected through July 15, 2006 with the split-beam only. Processing of the data is underway (August 2006) and a report is forthcoming. Since 2006 had extremely high flows (2 times the median, based on 77 years of data), the AFRP recommends that an additional year is needed to fully assess the feasibility for this type of monitoring. After two pilot years the final document will outline feasibility, one-time and annual costs for operating a hydroacoustic counting program at Mill Creek.

Antelope and Deer Creeks

Construction of an AFRP funded pool and weir type fish ladder on Deer Creek, in cooperation with the Deer Creek Watershed Conservancy (DCWC) and California Department of Fish and

Game (CDFG), was initially planned at the Cone-Kimball Diversion this fall 2006. However, due to an unforeseen delay in obtaining agreement from the Irrigation District, this project will be scheduled for a yet to be determined future date. All environmental compliance documents for the Cone-Kimball project are complete. AFRP has entered into negotiations with the DCWC to address maintenance and operational issues with a current fish ladder at the lower falls. (AFRP Restoration Plan, Deer Creek, supports A1:A5)

Additional agencies involved with this project include the Lassen National Forest, CDFG, and the National Marine Fisheries Service. The ability of spring-run Chinook to obtain access to the habitat above the ladder is vital to their continued existence in the watershed. This section of stream provides cold water holding and spawning habitat that is lacking below the ladder during low flow years.

The Antelope and Deer Creeks Fish Passage Projects were awarded to the California Department of Fish and Game in fall, 2005. A new fish ladder will be constructed on Antelope Creek; however, project construction had to be delayed until summer 2007 (AFRP Restoration Plan, Antelope Creek, E1). In 2006, CDFG staff collected site information and instream data at the proposed location to better validate structure design and placement, and initiated environmental compliance on the project. On Deer Creek a structure will be built below Stanford Vina Dam to raise the pool water elevation to enhance fish ladder access for salmon and steelhead. For both projects, monitoring will be in the form of photo points, stream flow measurements pre- and post- project, and post-project visits to evaluate adequacy of the structures and observe fish use. Post-project monitoring will also determine changes in ladder accessibility due to the pool elevation change and changes in pool depth. Established resource agency ladder design guidelines will be used. Monitoring will be provided by CDFG staff.

Cow Creek

A video weir is being set-up in the fall of 2006 to test the feasibility of this technology in determining the adult fall Chinook salmon spawning population on Cow Creek (AFRP Restoration Plan, Cow Creek, supports A1:A4). Additional AFRP and CDFG dollars facilitated the implementation of the video weir project. An AFRP partner, the Western Shasta Resource Conservation District will be the responsible entity for day-to-day operations, tape reading, and report writing.

Cottonwood Creek

AFRP funds were provided to the Cottonwood Creek Watershed Group to obtain a set of aerial photographs of the watershed in FY05 in order to move forward with watershed planning and assess stream conditions. However, upon discovery of another photo set that would suffice for that type of analysis, monies were redirected to 1) digitize and orthorectify the aerial photographs; 2) contact landowners and obtain permission for access; and 3) implement a field reconnaissance in fall, 2005 to determine number and distribution of fall-run Chinook salmon redds present in (lower) mainstem Cottonwood Creek (AFRP Restoration Plan, Cottonwood Creek, supports A1:A5).

Butte and Big Chico creeks

The Spring-run Chinook Juvenile Life History Evaluation on Butte and Big Chico Creeks continued to document juvenile Chinook salmon emigration timing, size at emigration, migratory patterns, growth rate (AFRP Restoration Plan, Big Chico Creek, supports A1:A8 & E1:E2; Butte Creek, E14). The project continued to generate adult escapement estimates using several methodologies for comparison, contributions to ocean and inland harvest, age composition, and straying to out-of-basin watersheds. The project has completed eleven years of research. Since 1998, over 1.1 million tagged wild juvenile salmon have been released. Butte Creek tagged salmon are being recovered in the Delta, the ocean harvest, and as adult spawners in Butte Creek. The project is now providing baseline information essential for the recovery and delisting, as well as directing and assessing restoration actions to benefit Butte Creek spring-run Chinook salmon and steelhead.

The status of the three Lower Butte Creek Project phases are: Phase I (Documenting Existing Conditions) is 100% complete; Phase II (Engineering Design/Environmental Docs/Permits) is 80% complete; and, Phase III (Construction) is 60% complete. Additional Phase II non-structural projects are under way in the Sutter Bypass with the completion of a memorandum of understanding for the east side of the Sutter Bypass that will result in the development of a fish passage restoration plan that will evaluate the small pumping plants and establish minimum flows for fish passage in both borrow channels of the Sutter Bypass. Projects recently completed in Phase III construction are: a) Sutter Bypass E-W Diversion Dam, b) Weir 5, c) Weir 3, d) Butte Sink Weir, e) North Weir, f) End Weir, g) Morton Weir, h) Field and Tule Turnout, i) Mile Canal Turnout, j) Drivers Cut Adult Fish Barrier, k) Reclamation District 833 Adult Fish Barrier; l) West of Butte Creek Bifurcation Dam, m) Drumheller Slough Adult Fish Barrier, and n) White Mallard Duck Club Adult Fish Barrier. An additional Phase III construction project, “White Mallard Dam and Fish Ladder” is approved and will proceed when funding is made available. (AFRP Restoration Plan, Butte Creek, A23, E6:E11, supports A1:A17 & E1:E15).

On Big Chico Creek, HDR Inc. and Sanders & Associates Geotechnical Engineering (SAGE) completed an investigation and produced an analysis report titled Evaluation of Iron Canyon for Proposed Fish Ladder Structure Repair and Construction (AFRP Restoration Plan, Big Chico Creek, A2). This report focused on geologic, seismic, structural, and constructability issues that should be considered during final design of the fish ladder repairs and was intended to supplement prior studies. The report concluded that, while many challenges existed for the construction, there was nothing from a geological, seismic, structural, hydraulic or hydrological perspective which would preclude the construction of the proposed fish ladder structure in Iron Canyon. Furthermore, the report stated that a properly constructed fish ladder in Iron Canyon should be expected to perform better than the existing structure has over a 50-year life span while having very low maintenance needs.

Yuba River

The “Spawning Habitat Integrated Rehabilitation Approach Based River Analysis and Sediment Transport Study, Phase II” (SHIRA) has improved our understanding of how gravel resources (i.e. spawning habitat) respond to changes in flow (AFRP Restoration Plan, Yuba River, E4). Results of Phase II of this study show a very high correlation between those areas the model predicted would be good spawning habitat, and actual GPS redd locations. Data collected to date includes: 1) a complete bathymetric survey of the spawning reach at the University of California property at flows of 600 cfs, 12,000 cfs, and 45,000 cfs; 2) velocity (flow and direction) profiles at the UC property; 3) model simulations (2-dimensional) of the spawning reach validated by redd data; and 4) velocity profiles at existing redd locations. The study will now move into Phase III, where a pilot gravel injection of 500 tons will be added into the Narrows reach immediately below Englebright Dam. The fate of this material will be monitored using magnetic tracer stones to determine the best location to add gravel, so that it is immediately available for spawning, and subsequently recruited downstream into other spawning reaches.

Two separate studies are examining the health of the salmonid populations by enumerating juvenile and adult abundance and timing in the Yuba River. “Chinook salmon and steelhead life history evaluation”, is entering its fourth year of data collection. The purpose of this study is to determine the timing, abundance, and distribution of adult Chinook salmon in the lower river using VAKI Riverwatchers, infrared detection devices, installed in both fish ladders at Daguerre Point Dam. To date this study has produced several interesting results including the detection of 753 adipose-fin clipped stray adults from the Feather River Hatchery entering the spawning reaches from July to September 2005. The second study, “Juvenile Life History Evaluation on the Yuba River”, is also entering its fourth year of data collection. The goal of this study is to trap, tag, and release naturally spawned juvenile Chinook salmon, and recapture them 3-5 years later as adults in the carcass surveys. This information can be utilized to estimate survival for in-river production (AFRP Restoration Plan, Yuba River, E4, supports A1:A9 & E1:E4).

Another ongoing project on the Yuba River, “Construct an exclusion device to prevent Yuba River salmon from accessing the Goldfields”, prevents adult fish from migrating into and becoming trapped in the Goldfields, while allowing water to flow from the Goldfields to the river. The Yuba Goldfields Barrier in the outfall of waterway 13 was constructed in August 2003 to eliminate entrainment of adults into the Goldfields; however, high flows in May 2004 that exceeded 45,000 cfs breached the structure. As a result AFRP provided funds in FY2005 to repair this damage. During the repair process stakeholders recognized that the nature of the waterway would not allow for a cost-effective permanent structure and decided to fill the breached area with unconsolidated fill material, creating a weak spot as an inherent design of the barrier. The barrier was subsequently breached and repaired on two separate occasions, once in December 2005 when flows in the river exceeded 114,000 cfs and again in February 2006 when flows in the river exceeded 50,000 cfs. (AFRP Restoration Plan, supports A1:A9 & E1:E4).

American River

In 2004, the AFRP provided funding to the “Lower American River Temperature Modeling Reduction Project” in order to evaluate and refine a river regulation plan that provides flows to protect all life stages of anadromous fish and identify and implement actions that maintain mean daily water temperatures between 61F and 65F for at least one month from April 1 to June 30 for American shad spawning. (AFRP Restoration Plan, American River, E3, supports A1:A4). The modeling effort was completed, and a presentation is scheduled for September. A final report is expected this fall, and the Project Manager will present the research to interested parties at the Lower American River Science Conference in June 2007. The results of this analysis have concluded that installing temperature curtains in Lake Natoma, a regulating reservoir just downstream of Folsom Lake, would not be effective for increasing cold-water pool availability because the lake does not stratify; hence the temperature of the water released from Folsom Dam is the temperature that will be available for the fisheries in the Lower American River (AFRP Restoration Plan, American River, E3 & supports A4).

Cosumnes River

AFRP provided funding to complete construction on several fish passage barriers in the Cosumnes River watershed. To date, the AFRP has fixed all but one of the major barriers on the Cosumnes River, Rooney Brothers Dam at River Mile 25. Construction on this barrier was expected to occur in fall 2005, but high flows did not allow for the construction to take place and the remaining \$ 142,863 had to be deobligated July 31, 2006 before construction could be started because of the Five Year Treasury rule and One-time Modification rule (AFRP Restoration Plan, Cosumnes River, E2)

The AFRP has funded an effort to identify water supply resources to be utilized in the Cosumnes River so that the lower river does not go dry in the early fall when adults are returning to the river to spawn (AFRP Restoration Plan, Cosumnes River, A1 & A2). The study portion, which AFRP funded, is complete and a report is available; however procurement of identified water resources is a lengthy process that involves the development of environmental permitting documents and negotiations with water rights holders. This procurement process is being conducted by Robertson-Bryan, Inc., who identified water resources outside the Cosumnes River basin, and is expected to be completed by the end of 2006.

Mokelumne River

Riparian restoration on Murphy Creek, a Mokelumne River tributary, was mostly completed by the East Bay Municipal Utilities District (AFRP Restoration Plan, Mokelumne River, A7). Efforts continue to maintain the site free of invasive species. Non-native species, mostly Himalayan blackberries, were removed and 461 native trees and shrubs were planted (AFRP Restoration Plan, Mokelumne River, A7 & Central Valley-wide E10). An exclusionary fence (7,732 ft) was installed to prevent cattle accessing the enclosed riparian area (17 acres). The AFRP funded “Mokelumne River spawning habitat improvement project”, added 6,168 tons of spawning gravel to the River channel, increasing spawning, incubation and rearing habitat for

salmonids (AFRP Restoration Plan, Mokelumne River, A2). An additional 23 tons of boulders were also added to improve rearing and holding habitat and increase habitat complexity. Two side-channel restoration projects to improve juvenile salmonid rearing habitat were also completed this year as part of the Mokelumne River Partnership (AFRP Restoration Plan, Mokelumne River, A7).

Biological benefits of the above projects include: reduced fine sediments and cattle waste; reduced water temperatures; additional rearing habitat; increased habitat complexity and additional food resources. Monitoring of gravel augmentation has occurred and will continue in order to document the utilization of added gravel and the habitat variables associated with preferred spawning sites (AFRP Restoration Plan, Mokelumne River, A2). The above projects address the limiting factors of insufficient spawning and rearing habitat and sediment and erosion control. Added gravel has been heavily utilized according to recent redd surveys.

Calaveras River

AFRP funded projects included improvements to the operation and efficiency of the Bellota Weir fish ladder (allowing more steelhead and salmon to reach spawning grounds) (AFRP Restoration Plan, Calaveras River, A3 & A4). These efforts addressed salmonid limiting factors on the Calaveras River, passage of adults and juveniles and entrainment of juveniles into water diversions. Quite recently, video documentation of Bellota Weir salmon passage problems during high flows was obtained. Entrainment of juvenile salmonids will continue to occur until diversions are screened. Acting on AFRP recommendations, the Stockton East Water District (SEWD) has implemented temporary screening at the Bellota diversion. Monitoring continues to document stranding and should continue to provide baseline information until improvements are made and monitoring can verify the reduction in stranding and entrainment. A carcass survey was conducted when flood control releases allowed migration of fall-run Chinook salmon into the system. The escapement estimate for the 2005 fall-run Chinook salmon population for the Calaveras River is 868 fish.

A flow modeling study conducted by the California Department of Water Resources to prioritize passage improvements is nearly complete. AFRP has funded an additional flow study that will complement the DWR study by evaluating passage through the channels between structures. Completion of this study was delayed by flood control releases that prevented in-channel work. AFRP is also participating in the NOAA/SEWD Habitat Conservation Plan workgroup for steelhead along with other state and federal agencies. A preliminary engineering study to replace the Bellota Weir, the diversion screen and fish ladders was completed utilizing funding from the California Bay-Delta Authority.

Stanislaus River

Accurate and standardized escapement data are necessary to evaluate the AFRP's progress towards doubling. The AFRP is currently funding the "Test and Demonstrate a Portable Alaskan Weir to Count and Characterize Runs of Anadromous Salmonids in the Stanislaus River Project"

and to demonstrate an emerging technology (VAKI Riverwatcher-infrared detection devices- and digital photography) (AFRP Restoration Plan, Stanislaus River, supports A1:A3 & E1:E6 & Central Valley-wide- A1). The weir monitored passage of 3,865 Chinook salmon and one steelhead over the sampling period. DFG carcass surveys estimated 3,315 escaping Chinook (Schaefer estimate), providing a close estimate of actual weir counts. Carcass surveys cannot address steelhead passage. This project provides an accurate and standardized assessment of escapement. This methodology of collecting fish abundance and timing data has utility for enumerating salmonid runs on other CV streams.

The AFRP funded an additional year of egg survival studies to evaluate two different gravel augmentation projects in the Stanislaus River, but the studies were disrupted by extended flood releases that scoured spawning riffles (AFRP Restoration Plan, Stanislaus River, A2). The initial studies indicated that egg survival was relatively high (70% survival) in gravels at 18 restoration sites constructed in 1999; whereas egg survival was relatively low (1% survival) in dredger-tailing sized gravels placed near Goodwin Dam in 2004. Further research is needed to verify that egg survival is low in dredger-tailing sized gravels, which typically lack particles smaller than 0.75 inches, and to determine survival rates in other sizes of gravel, such as those lacking particles smaller than 0.5 inches. This is an important issue because we need to provide gravel that enhances egg survival; whereas, using dredger-tailing sized gravel substantially reduces restoration costs.

Applications have been submitted for the environmental permits needed for the Lover's Leap Gravel Augmentation Project and it is anticipated that 25 gravel beds will be constructed by Fall 2007 that will substantially increase the quantity and quality of available spawning and rearing habitat for fall-run Chinook salmon and Central Valley steelhead (AFRP Restoration Plan, Stanislaus River, A2).

The AFRP is also funding the development of a restoration plan and contains a completed summary of existing fisheries information, and a set of conceptual models addressing watershed planning limiting factors. Future efforts as part of this restoration plan will focus on prioritizing restoration actions and developing a floodplain restoration action plan (AFRP Restoration Plan, Stanislaus River, A2).

The AFRP also manages a 3406 (b)(2) funded juvenile Chinook salmon rotary screw trap monitoring project. This long-term monitoring effort is used to correlate in-river flow with juvenile survival through the lower river from Oakdale to Caswell.

Tuolumne River

Ongoing projects to restore spawning, rearing, and floodplain habitats in the Tuolumne River include: a) at the Warner-Deardorff site, a captured mine pit was isolated, the levee was set back, and spawning and holding habitats were restored in a 0.25 mile section; b) the appraisal was finalized for the "MJ Ruddy Restoration Project"; c) the post-project monitoring of the "Grayson River Ranch Floodplain Restoration Project" was completed (CBDA funded project); d)

revegetation was completed at the Bobcat Flat (RM 43) restoration project (CBDA and 4-Pumps funded project); and e) the “Fall Attraction Flow Study” was continued due to delays caused by high flows (AFRP funded project). All of the remaining funding for the MJ Ruddy Restoration Project, which included \$1,132,662 in AFRP funds and \$3,136,396 in CALFED federal funds, was deobligated in 2006 before construction could be started because of delays associated with a property appraisal process and the Five Year Treasury Rule (AFRP Restoration Plan, Tuolumne River, A2).

Population trend analyses based on escapement surveys and rotary screw trapping have been completed recently to evaluate the success of the early restoration projects and to evaluate potential limiting factors for adult production in the Tuolumne River (AFRP Restoration Plan, Tuolumne River, supports A1:A3 & E1:E4). The preliminary results suggest that the number of smolt-sized Chinook salmon migrating from the river has not increased since 2002 in response to several gravel augmentation projects near La Grange and two predator isolation projects at Special Run Pools 9 and 10. Instead, the results suggest that inadequate flows between February and mid-June and degraded rearing habitat in the Tuolumne River appear to be the primary limiting factors for the production of both smolt out-migrants and adult salmon. The number of adult Tuolumne River salmon is highly correlated with the number of smolt-sized juveniles (> 70 mm fork length) that successfully out-migrated from the river in spring between 1998 and 2005; and spring flows in the Tuolumne River are highly correlated with both the abundance of smolt out-migrants and adult production. Conversely, neither the number of smolt out-migrants nor adult escapement is correlated with the number of fry produced in the Tuolumne River. This suggests that although the spawning habitat is highly degraded in the Tuolumne River, relatively few of the millions of fry produced survive to a smolt-size due to the low winter and spring flows and degraded rearing habitats in the Tuolumne River. The AFRP is working with the California Department of Fish and Game, National Marine Fisheries Service, City and County of San Francisco, and the Turlock and Modesto irrigation districts to implement a rigorous research program to test key hypotheses regarding flow management and restoration priorities. As part of this research program, the effectiveness of new habitat restoration that focuses on improving fry rearing habitat by increasing floodplain connectivity with the active channel and enhancing riparian forests will be compared to the effectiveness of ongoing projects that have focused on adding and mobilizing gravel to enhance spawning habitat. Funding for a majority of this research program is expected to be provided by CBDA, the City and County of San Francisco, and the Turlock and Modesto irrigation districts.

Merced River

Ongoing projects to restore spawning, rearing, and floodplain habitats in the Merced River are all in initial conceptual stages and include the “Upper Western Stones Project” (4-Pumps funded) and the “Merced River Dredger Tailings Reach Phase I” project (partially funded by CBDA) (AFRP Restoration Plan, Merced River, A3). The objective of these two projects is to reconstruct riffle-pool sequences and floodplain habitats to provide spawning and rearing habitats in areas that were severely degraded by past mining operations. While there are sufficient funds from 4-Pumps to complete the Upper Western Stones Project, landowner

concerns are causing delays.

One AFRP-funded study which is investigating the feasibility of reintroducing anadromous salmonids above Crocker-Huffman Dam, has been delayed by flooding during 2005 and 2006 and may not be completed until fall 2007.

Another AFRP-funded study is assessing the restored spawning habitat in the 4-Pumps funded Robinson Ranch Project. The initial results indicate that number of Chinook salmon spawners has returned to the pre-1997 flood damaged levels and that stream bed complexity (e.g., mounds of gravel dispersed over the gravel bed) is an important feature that determines spawner use. It is anticipated that a fourth year of study will evaluate the survival of salmon eggs in the restoration gravel. Although the project designs called for on-site gravels to be cleaned with a 0.25-inch screen, the gravels appear to have been cleaned with a larger screen, possibly between 0.5 inches and 0.75 inches. If the restoration gravels lack particles smaller than about 0.75 inches in diameter, then egg survival may be lower than expected based on the Stanislaus River studies described above. The Robinson Ranch egg survival study will verify the size of the gravels placed in the river and the survival of eggs in the restoration gravels as well as in nearby unrestored gravels. These results, along with similar studies in the Stanislaus and Tuolumne Rivers, will help determine the appropriate gravel sizes needed for future gravel augmentation projects. Approximately 130,000 cubic yards of gravel will be placed in the Tuolumne River (CBDA funded) beginning in 2007 and large gravel augmentation projects are planned for the Merced River at the Merced River Ranch and Upper Western Stones (**AFRP Restoration Plan, Merced River, A3**).

The Merced River Salmon Enhancement Project (RM 40 – 44.5), which has been jointly funded by 4-Pumps and the AFRP, may have increased the survival of salmon smolts based on DFG studies with coded-wire-tagged hatchery fish. This project has three completed subprojects, which includes the 1996 Magnuson predator isolation project, the 1998 Ratzlaff predator isolation project, and the 2001 Robinson Ranch channel reconstruction project. These studies were not able to determine whether the improved survival was due to the expensive predator isolation projects or the channel reconstruction project or both (**AFRP Restoration Plan, Merced River, A3**).

VI. Tasks, Costs, Schedules and Deliverables

A. Narrative Explanation of Programmatic Tasks.

1.0 Program management

Program management (STFWO) - The USFWS Anadromous Fish Restoration Program (AFRP) Manager (PM) is responsible for managing the AFRP. The Assistant AFRP Program Manager reports directly to the AFRP PM and implements the AFRP. The Habitat Restoration Coordinators (HRC) identify restoration priorities, develop and nurture restoration partnerships, review proposals within the CBDA ERP Proposal

Solicitation Process framework, recommend projects for AFRP funding, manage project deadlines and deliverables and implement the AFRP. The Assistant HRC's assist the AFRP PM, the Assistant PM, and HRC's on all AFRP work.

- 1.1 The program develops all grants and cooperative agreements and implements the overall program including outreach, coordinating with stakeholders, identifying funding partners and funding peer-reviewed restoration projects.
- 1.2 Program management liaison- The US Bureau of Reclamation (USBR) Liaison coordinates AFRP activities between the AFRP and the USBR and assists in developing and implementing the overall program including outreach, coordinating with stakeholders, and identifying partnering funds.
- 1.3 Program implementation (Red Bluff Fish and Wildlife Office (RBFWO)) - Same as 1.1 above.
- 1.4 Management/Administrative support (CNO) - The CNO provides support to the AFRP in management, interagency program coordination, external affairs and administration.
- 2.0 Environmental Documentation and appraisal review and technical support
- 2.1 Incremental Flow Instream Methodology (IFIM)- The IFIM biologists carry out AFRP directed IFIM studies in the Sacramento and San Joaquin basin rivers and tributaries. These activities, instream flow requirements for CVPIA, are covered under a separate program, 3406 (b)(1)(B).
- 2.2 Environmental compliance (HCD)- completes AFRP requested documents under the National Environmental Policy Act, Endangered Species Act, and cultural resource environmental documentation for AFRP projects.
- 2.3 Endangered Species Act compliance (ESP)- AFRP Program Manager coordinates for any proposed restoration activities that the AFRP is lead on.
- 2.4 California-Nevada Office (CNO): Realty program provides realty support services to the AFRP.
- 3.0 Project funding and implementation: (See Budget Tables D and E)

B. Schedules and Deliverables

#	Task	Dates		Deliverable
		Start	Complete	
1.0	Program Management			Provides a draft FY2006 Annual Work Plan (AWP), final grants, cooperative agreements, and contracts for projects supported by the AFRP, identifying partners and cofunding, selecting and funding peer-reviewed restoration projects.
1.1	Program Management-(STFWO)	10/01/06	09/30/07	Program manager is responsible for AFRP performance and CBDA integration. Assistant Program Manager reports to Program Manager and implements the AFRP (see 1 above). Habitat Restoration Coordinators (HRC) provide program implementation, prioritize projects, develop partnerships, develop proposals, and manage project deadlines and deliverables. Assistant HRCs support all HRC work.
1.2	Program Management-(USBR)	10/01/06	09/30/07	Provides liaison between USBR and AFRP
1.3	Program implementation-(RBFWO)	10/01/06	09/30/07	Habitat Restoration Coordinators (HRC) provide AFRP Program implementation (Red Bluff Fish and Wildlife Office (RBFWO)) - Same as 1.1 above.
1.4	Management/Administrative support (CNO)	10/01/06	09/30/07	Provides support in external affairs, administration and interagency program coordination to AFRP.
2.0	Environmental Documentation and appraisal review and technical support	10/01/06	09/30/07	Provides IFIM evaluations, NEPA and ESA compliance and real estate appraisal reviews for AFRP-led projects
2.1	Instream flow evaluations (CNO)	10/01/06	09/30/07	Conducts instream flow, spawning habitat studies, prepares annual reports.

#	Task	Dates		Deliverable
		Start	Complete	
2.2	Environmental compliance (CNO)	10/01/06	09/30/07	Provides NEPA and ESA documents required for obligation of program funds as required for each of the projects supported by the program.
2.3	Endangered Species Act compliance (CNO)	10/01/06	09/30/07	Provides Biological Opinions, EA's and NEPA documents on AFRP-led projects.
2.4	California Nevada Office – Realty (CNO-Realty)	10/01/06	09/30/07	Provides realty support services, appraisals, escrow and contract review management to the AFRP.
3.0	Project funding and implementation	10/01/06	09/30/07	Project funding and implementation. As part of efforts to better integrate implementation of CVPIA and CBDA programs consistent with the CBDA Implementation Memorandum of Understanding, the AFRP expects to prioritize future projects fully considering the CBDA ERP Proposal Solicitation Process (PSP). Projects will be identified for funding based on their contribution to the AFRP and CBDA program objectives, and their consistency with the priorities listed in Section III, Program Objectives. Some of the specific projects may be a continuation of previously funded projects, others will be new to the program. Project prioritization will also be closely coordinated with other CVPIA related program activities and with the USBR's Central Valley Project Conservation Program.

C. Summary of Program Costs and Funding Sources (FY 2007)

	Task	Total Costs	Funding Sources
			RF
1.0	Program Management	1,864,576	1,864,576
1.1	Program Management- (STFWO)	1,230,311	1,230,311
1.2	Program Management- (USBR)	33,104	33,104
1.3	Program implementation-(RBFWO)	401,873	401,873
1.4	Management/Administrative support (CNO)	199,288	199,288
2.0	Environmental Documentation and appraisal review and technical support	1,052,470	1,052,470
2.1	Instream flow evaluations (CNO)	703,944	703,944
2.2	Environmental compliance (CNO)	199,158	199,158
2.3	Endangered Species Act compliance (CNO)	99,579	99,579
2.4	California Nevada Office – Realty (CNO- Realty)	49,789	49,789
3.0	Project Funding and Implementation	1,282,954	1,282,954
	Total Program	4,200,000	4,200,000

D. AFRP Program Budget (FY 2007)

	Task	FTEs	Direct salary and Benefits Costs¹	Contract costs	Admin. Costs³	Total costs
1.0	Program Management (Total)	9.90	1,528,576		336,001	1,864,576
1.1	Program Implementation (STFWO)	6.60	1,008,452		221,859	1,230,311
1.2	Program Management (USBR)	0.25	27,369		5,735	33,104
1.3	Program implementation (RBFWO)	2.00	329,404		72,469	401,873
1.4	Management/Administrative support (CNO)	1.05	163,351		35,937	199,288
2.0	Environmental Documentation and appraisal review and technical support (Total)	5.57	862,680	1,210,334	189,790	1,052,470
2.1	Instream flow evaluations (CNO)	3.72	577,003		126,941	703,944
2.2	Environmental compliance (CNO)	1.05	163,244		35,914	199,158
2.3	Endangered Species Act compliance (CNO)	0.53	81,622		17,957	99,579
2.4	California Nevada Office – Realty (CNO- Realty)	0.26	40,811		8,978	49,789
3.0	Project Funding and Implementation (Contract & grant costs)			1,210,334	72,620	1,282,954
	Total by Category	15.47	2,391,256	1,210,334	598,410	4,200,000

¹ These numbers are based on FY2006 direct salary and benefits expenditures and increased by 5% to reflect an estimate of FY2007 direct salary and benefits budget.

² This number represents other expenses (travel, training, supplies, lease, etc.).

³ Numbers in this column are FWS Overhead rates of 22% for Operations and 6% for Contracts/Grants/Agreement